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New records of two crustose sorediate lichens from central Europe

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Abstract — *Halecania viridescens* is reported for the first time for Poland, and *Lepraria granulata* is new to Poland and Slovakia. Both species belong to a group of sterile lichens where secondary chemistry plays an important role in the taxonomy. Taxonomic descriptions and comments are provided.

Key words — lichenized fungi, chemotaxonomy, lichen metabolites, geographical distribution

Introduction

Sorediate crustose lichens are one of the weakly studied groups in central and eastern central Europe. Most records are based only on morphological characters with chemistry not checked by thin layer chromatography, making the reports frequently unreliable. Although some species are quite well studied, they represent easy-to-determine taxa or lichens that often produce both apothecia and vegetative diaspores like soredia. Recently several new reliable records of sorediate crustose lichens have been published from many regions (e.g. Schreiner & Hafellner 1992, Tønsberg 1992, Śliwa & Tønsberg 1995, Motiejūnaitė et al. 2003, Prigodina-Lukošienė et al. 2003, Czarnota & Kukwa 2004, 2007, Kukwa 2005, Kukwa & Motiejūnaitė 2005, Boom & Palice 2006, Kukwa & Kubiak 2007), but many are still known only from a few localities. Within the group, the genus *Lepraria* Ach. seems to be the best studied (e.g. Kukwa 2001, 2006, Bayerová & Kukwa 2003, Bayerová 2006), but still the knowledge is far from satisfactory, as taxa new to science are still being discovered (Bayerová et al. 2005, Slavíková-Bayerová & Orange 2006, Slavíková-Bayerová & Fehrer 2007). The other similar case is *Ochrolechia* A. Massal., which at present is thoroughly studied in Poland (Jabłońska & Kukwa 2007, Kukwa 2008).

In this paper we further contribute to the knowledge of sorediate lichens from central Europe. Two taxa are reported. The first, *Halecania viridescens*, is a

rather inconspicuous species that, when sterile, is difficult to determine without experience. The second species, the recently described *Lepraria granulata,* is thus far known from only a few localities.

Material and methods

All cited material (including types) is housed in the following herbaria: BG, BM, E, KRAM and UGDA. Duplicates of *Halecania viridescens* have been donated to GPN and KRAM. Chemical analyses were performed by thin-layer chromatography (TLC in solvent A, B and C) according to the methods of Orange et al. (2001). When a lichen substance was always present it is marked with '(+)', but if the metabolite was absent from some specimens, '(±)' is used.

The taxa

Halecania viridescens Coppins & P. James, in Coppins, Lichenologist 21: 224. 1989.

Description: Thallus corticolous, epiphloeodal, areolate, areoles scattered to contiguous, rounded, convex, fragile, mostly dissolved into soralia; soralia numerous, up to ca. 0.2 mm diam., punctiform, discrete to confluent in places, sometimes forming small patches of leprose crust, vivid-green to brow green due to the pigmentation of outer soredia; soredia farinose, internal green, external usually with brown pigment, often shed and than exposing the inner soredia; apothecia not found in Polish material. For the detailed description see Coppins (1989a) and Tønsberg (1992).

Chemistry: The following substances were detected in the specimens studied: argopsin (+), norargopsin (±), unknown substance [i.e., 'gracilenta unknown 1' (+), see Tønsberg 1992] with an additional related substance in minor amount in Rf classes B3, C5 (±; not observed in solvent A) and unknown pigment in Rf class C2–3 (±; found only once, but also detected in Polish material of *Biatora efflorescens* (Hedl.) Räsänen, another lichen producing argopsin). In general our results agree with Coppins (1989a) and Tønsberg (1992).

Ecology — *Halecania viridescens* was found in habitats with high humidity that are influenced by human impact. It was growing on free standing trees surrounded by meadows, at the edge of or inside of managed forests, always in river valleys. Associated lichens species included typical species inhabiting roadsides or free standing trees: *Amandinea punctata* (Hoffm.) Coppins & Scheid., *Bacidia adastra* Sparrius & Aptroot, *B. naegelii* (Hepp) Zahlbr., *Caloplaca obscurella* (J. Lahm ex Körb.) Th. Fr., *Candelariella* spp., *Lecania cyrtella* (Ach.) Th. Fr., *Lepraria* sp., *Parmelia sulcata* Taylor, *Phaeophyscia orbicularis* (Neck.) Moberg, *Physcia* spp., and *Physconia* spp.

Geographical distribution — The species is quite rarely reported but rather widely distributed. It is known from Austria (Berger & Türk 1993), British Isles (Coppins 1989a), Czech Republic (Boom & Palice 2006), Norway (Tønsberg 1992), France and Spain (Boom et al. 1995), Portugal (Aptroot et al. 1992), Slovakia (Guttová & Palice 2001), and Sweden (Ekman & Arup 2000). Outside Europe it has been reported from Pacific Northwest in North America (Tønsberg 1994), Guatemala in central America (Boom et al. 2007), and the Canary Islands in Africa (Tønsberg 2002a). Here it is reported as new to Poland. The record from Pieniny Mts is also only the second report for the entire Carpathian range.

Comments — The species is predominantly characterized by small, usually discrete soralia (often with a brown pigment in the external soredia) and the presence of argopsin and 'gracilenta unknown 1' (Coppins 1989a, Tønsberg (1992). When sterile, *Halecania viridescens* is morphologically similar to *Rinodina efflorescens* Malme and *R. griseosoralifera* Coppins, both of which also develop brownish, external soredia. The latter two taxa can be easily separated from *H. viridescens* chemically: *R. efflorescens* contains pannarin and zeorin as major secondary compounds (Tønsberg 1992, Kowalewska & Kukwa 2003), whereas R. *griseosoralifera* produces atranorin and zeorin (Coppins 1989b, Czarnota & Kukwa 2007). Usually all three species lack apothecia (in Poland only *R. efflorescens* was very rarely found with fruit bodies), but if fertile, they also differ in the type of spores. *Halecania viridescens* produces hyaline, thin-walled spores, often covered with a gelatinous epispore, whereas both *Rinodina* species develop brown spores with ±thick walls and without an epispore (Coppins 1989a, b; Tonsberg 1992).

Argopsin, the major lichen substance present in *Halecania viridescens*, is also known in four sorediate species of *Biatora*, namely *B. bacidioides* Printzen & Tønsberg, *B. britannica* Printzen et al., *B. efflorescens* and *B. printzenii* Tønsberg. They may be mistaken for *Halecania viridescens* (Tønsberg 1992, 2002b, Printzen & Tønsberg 2003) but differ predominantly chemically, as no *Biatora* species contains 'gracilenta unknown 1'; additionally, *B. bacidioides* and *B. printzenii* produce gyrophoric acid. When fertile, all taxa can be separated by apothecial type: *Halecania viridescens* develops lecanorine apothecia with entirely sorediate margins, whereas the apothecia of all *Biatora* species lack a thalline margin (Coppins 1989a; Tønsberg 1992, 2002b; Printzen & Tønsberg 2003). So far only *B. britannica* and *B. efflorescens* are known from Europe, and only the latter from Poland and adjacent areas.

Specimens examined — **POLAND. Iława Lakeland.** N part of Nowa Wieś village, by Postolińska Struga stream, on *Salix* sp.—02.11.2004, M. Kukwa 3592 & 3600 (UGDA–L–14244 & 14340, GPN, KRAM). Ca. 0.5 km NNW of Nowa Wieś village, on *Salix* sp.—02.11.2004, M. Kukwa 3605 (UGDA–L–14341). **Wschodniosuwalskie**

Lakeland. Turtul settlement, Czarna Hacza river valley, 54°13'19"N/22°48'35"E, on *Salix fragilis*—09.07.2006, M. Kukwa 5772 (UGDA–L–14293). **Kaszubskie Lakeland.** Dolina Ewy valley, 54°24'31"N/18°31'45"E, on *Sambucus nigra*—04.04.2004, M. Kukwa 2990 (UGDA–L–14242). **Western Carpathians: Pieniny Mts.** Pieniński National Park, S of Krościenko village, along Dunajec river, 49°25'55"N, 20°26'15"E, on *Salix* sp.—02.05.2008, M. Kukwa 5956b (UGDA–L–14686).

Reference material examined (selected)—**GREAT BRITAIN. Scotland: Dunbarton (V.C. 99).** Loch Lomond NNR, Shore Wood, by shore of lake, on *Salix* sp.—05.09.1980, B.J. Coppins 8212 (**isotype**-E). South side of River Lyon, downstream of Bridge of Balgie, 200 m, on *Populus tremula*—19.06.2004, C.J. Ellis, B.J. Coppins (E). **NORWAY. Hordaland:** Bergen, Tertnes, UTM 32V KN 9808, 60 m, on *Aesculus hippocastanum*—23.08.1992, T. Tønsberg 17763 (BG L–25552).

Lepraria granulata Slavíková, in Slavíková-Bayerová & Fehrer, Lichenologist 39: 321. 2007.

Description: Thallus granular, white to grey, ± with a faint bluish tinge, delimited with obscure marginal lobes or diffuse; hyphae below the thallus scarce, greyish (pale yellowish orange-brown hyphae, as cited in the protologue, were not observed); soredia coarse, up to ca 200 µm, projecting hyphae not observed. For a more detailed description see Slavíková-Bayerová & Fehrer (2007).

Chemistry: Atranorin (+), fatty acid called 'granulata unknown 1' (see Slavíková-Bayerová & Fehrer 2007) and an unidentified pigment (anthraquinone; ±) were detected. Slavíková-Bayerová & Fehrer (2007) report an additional fatty acid — 'granulata unknown 2' — as a common accessory substance that was not detected in our examined specimens.

Ecology — *Lepraria granulata* was found on saxicolous mosses or directly on siliceous rocks in open and rain-exposed sites at high elevations. In Polish collections no accompanying species were noted. The Slovak specimen grew together with *L. borealis* Loht. & Tønsberg (chemotype with angardianic/roccellic acid; see Prigodina-Lukošienė et al. 2003).

Geographical distribution — *Lepraria granulata* has been reported so far from Austria, Bulgaria and the Czech Republic (Slavíková-Bayerová & Fehrer 2007). Here it is reported as new to Poland and Slovakia. The Polish record was previously misidentified as *L. borealis*, but re-examination of two *L. borealis* samples kept in UGDA suggest that they represent *L. granulata*. Because a true *L. borealis* still occurs in the same ATPOL grid square, the Kukwa (2006) distribution map fortunately does not need to be updated.

Comments — There are several *Lepraria* species with similar thallus organization (granular, usually grayish thallus, in many samples with obscure lobes) and ecology (the occurrence on rain-exposed habitats), which form the

so-called *Lepraria neglecta* group (Leuckert et al. 1995, Ekman & Tønsberg 2002, Tønsberg 2004, Slavíková-Bayerová & Fehrer 2007). As the morphology in all concerned taxa is actually identical, the secondary chemistry remains the best reliable and useful character to discriminate all species. In the past some doubts existed if such a character can be sufficient for the recognition of the taxa at species level, or if only chemotypes of a single species should be distinguished. However, recent molecular studied showed that the species are genetically different. The problem appeared to be more complicated as even the chemotypes of *L. caesioalba* (B. de Lesd.) J.R. Laundon did not form a monophyletic group (Ekman & Tønsberg 2002). It seems to us that those chemical strains can be recognized at the species level, but that needs further studies. Molecular analyses also confirmed the taxonomic importance of fatty acids in the species recognition (Ekman & Tønsberg 2002, Slavíková-Bayerová & Fehrer 2007), which was sometimes put into question as well (e.g. Laundon 1992). Recently Slavíková-Bayerová & Fehrer (2007) defined the group more precisely as the *L. neglecta* core group, and added also two, still not formally described taxa with a more leprose thallus.

Lepraria granulata is differentiated from other species with granular thalli only by the presence of the fatty acid 'granulata unknown 1' (sometimes with 'granulata unknown 2'). The substance is not known in any other *Lepraria* species, except the undescribed '*Lepraria* sp. G' (see Slavíková-Bayerová & Fehrer 2007). The latter taxon differs in the thallus morphology, which is leprose and more similar to *L. humida* Slavíková & Orange than *L. granulata* (Slavíková-Bayerová & Orange 2006, Slavíková-Bayerová & Fehrer 2007). Other morphologically similar species can be distinguished by the presence of different fatty acids (roccellic and rangiformic acids in *L. borealis* and one unnamed taxon; see Ekman & Tønsberg 2002), production of alectorialic acid [*L. neglecta* (Nyl.) Erichsen] or porphyrilic acid [*L. alpina* (B. de Lesd.) Tretiach & Baruffo], or the occurrence of several depsidones, like fumarprotocetraric acid, stictic acid, and psoromic acid (*L. caesioalba* with 3 to 5 chemotypes) (Laundon 1992, Tønsberg 1992, 2004; Lohtander 1994, Baruffo et al. 2006, Slavíková-Bayerová & Fehrer 2007).

Specimens examined—**POLAND. Western Carpathians: High Tatra Mts.** Tatra National Park, Krzyżne, side from Dolina Roztoki valley, by the yellow tourist path, 1820 m, 49°13'3"N/20°02'45"E, on saxicolous mosses—09.08.2003, P. Czarnota s.n. (UGDA–L–10504 & 11011). **SLOVAKIA. Western Carpathians: High Tatra Mts.** Tatra National Park, N of Štrbské Pleso town, Furkotská valley, on rocks—16.081999, M. Kukwa s.n. (UGDA–L–6928).

Reference material examined—**BULGARIA. Rita Mts.** Rila National Park, by the marked path from the hut Rilski ezera to the hut Sedemte ezera, c. 600 m, W of lake Dolnoto ezero, 42°12'47"N, 23°19'10"E, on mosses, 22.06.2004—Š. Bayerová 3237, M. Slavík (**duplicate of paratype**-UGDA–L–14309, ex herb. Slavíková-Bayerová).

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